

Original Research Article

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Neonatal hearing screening- time to make a noise- experience from a private medical college in South Rajasthan

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ABSTRACT

Background: Neonatal Hearing Loss has a prevalence that is twice than that of disorders like congenital hypothyroidism, phenyl ketonuria etc. Early detection of hearing impairment is vital since early intervention in form of hearing aids and speech therapy would help lead a child a normal life. The aim of the study was to set up a neonatal hearing screening program and to study the various risk factors which could be associated with hearing loss.

Methods: The prospective descriptive study was carried over a period of two years. All neonates before being discharged were subjected to OAE. OAE was done on Oto Read Machine (Intra acoustic) and BERA was done on BERA eclipse machine (Intra acoustic). Babies who failed the first OAE were called back for a repeat OAE at six weeks of age. Babies who failed the second OAE were referred to a trained audiologist for BERA which was performed on BERA Eclipse machine.

Results: Out of 1114 neonates screened, 285 neonates failed the first OAE and were called back at six weeks for repeat OAE. Out of the 285 babies who were called for repeat OAE, 258 turned up 27(9.47%) were lost to follow up. Out of the 258 babies who turned up, 245 passed the test while 13 failed the test. 13 Babies who had failed the second OAE screening were called back 1 month later for BERA testing. Out of the 13 babies who turned up for BERA testing, 12 passed the test and 1 failed giving us a prevalence of 0.89 per 1000 population. Of the various risk factors studied only low birth weight was found to be having significant association with hearing loss.

Conclusion: Neonatal hearing screening is the need of the hour. Larger multi centric studies are required to establish the prevalence of hearing impairment among newborns.

Key Words: Brainstem Evoked Response Audiometry, Hearing impairment, Hearing loss, Neonate, Oto- Acoustic emissions, Screening

INTRODUCTION

Neonatal Hearing Loss has a prevalence that is more than twice that of other newborn disorders like congenital hypothyroidism, phenyl ketonuria etc.^{1,2} The incidence of Congenital Bilateral hearing impairment is 1 to 5 per 1000 live births and when unilateral hearing impairment is included it goes up to 8 per 1000 live births.³⁻⁵ Studies done from various parts of India have shown prevalence

of neonatal hearing loss to vary between 1 and 8 per 1000 babies screened.⁶⁻⁸ Left undetected, hearing impairment among infants can negatively affect speech and language development thereby compromising a child's academic achievement and overall development. Early identification and intervention by six months of age provides for better prognosis in language development and better integration into society.

American Academy of Pediatrics (AAP) in 1999 advocated Universal newborn hearing screening programme and remedial intervention which is being practiced in most of the developed countries. AAP follows the rule of 1-3-6, i.e all newborns should be screened by 1 month of age, hearing loss should be identified by 3 months of age and if identified as deaf intervention or treatment should be done by 6 months of age.⁹ In a developing country like India the risk of infants to develop these difficulties is obviously more.^{10,11} The National Programme for prevention and control for Deafness (NPPCD) was launched by the ministry of Health and Family Welfare, Government of India in 2006, under the broader program of the National Rural Health Mission(2005-12). Under this program, both institution based and community based screening was targeted towards babies not born in hospitals. In 2013, the government of India launched the Rashtriya Bal swastya Karyakaram(RBSK). This new initiative involved child-health screening and early intervention services for children aged 0-18 years of age, for defects at birth. Under RBSK, children undergo community level screening by mobile health teams. Screening is also conducted at public health facilities like Primary Health Centre, Community health centre etc.¹² Neonates of all institutional deliveries should undergo neonatal hearing screening. In spite of all this not many centers across the nation have introduced neonatal hearing screening for all their newborns.

The need for universal hearing screening in neonates and its effectiveness has been proven well. Tests used for screening newborns for hearing loss include Oto-Acoustic emissions (OAE) and automated Brainstem response audiometry (AABR).¹³⁻¹⁵ While OAE is cheap, quick, simple, and reliable with a sensitivity of 100% and specificity of 99% respectively, AABR has an additional advantage of identifying neonates with auditory neuropathy unlike OAE which has its limitations. The other advantages of AABR include rapidity, easy to use and high sensitivity (0.99) and specificity (0.87).^{16,17}

This study was undertaken with the primary objective of exploring the feasibility of setting up a universal hearing program for private and medical college and also to identify the prevalence of hearing loss and also to identify risk factors associated with hearing loss among neonates.

METHODS

The prospective descriptive study was carried from October 2016-September 2018, all the neonates born during this period were included in the study. Study population included all the inborn neonates delivered in the hospital during the study period. The exclusion criterion included neonates whose parents refused for screening, neonates who died and those neonates who were referred to higher centers for treatment. Prior clearance from Institutional Ethics Committee was sought

before starting the study. All neonates before being discharged were subjected to OAE. OAE was done on Oto Read Machine (Intra acoustic) and BERA was done on BERA eclipse machine (Intra acoustic). Both the tests were done by a trained technician. Risk factors evaluated included Low birth weight, Prematurity, Birth asphyxia, Jaundice requiring Phototherapy, NICU stay of >5 days, use of Ototoxic medications, family history of deafness, congenital infections and Culture positive neonatal sepsis. Babies who failed the first OAE were called back for a repeat OAE at six weeks of age. We kept the second OAE at six weeks of age so as to coincide with immunization visit. A nursing staff was designated for the task for reminding the parents telephonically to bring the child on the scheduled date for follow up OAE.

Babies who failed the second OAE were referred to a trained audiologist for BERA which was performed on BERA Eclipse machine.

Statistical Analysis was done using computer software SPSS. Data were entered on a predesigned EXCEL work sheet. Data was expressed in frequency and percentage. To elucidate the associations Chi square test and student's t test were used. For all statistical evaluations, a two tailed probability of value <0.05 was considered significant.

RESULTS

A total of 1114 neonates formed the study group (Table 1). 829 neonates (74.42%) passed the first OAE, 285 neonates failed the first OAE and were recalled back for second OAE at 6 weeks of age. Our recall rate was 25.58%. Among the 1114 neonates who were a part of the study group 781(70.11%) had no risk factors while 333(29.89%) had risk factors (Table 2).

Table 1: Percentage Distribution of Sample according to first OAE.

First OAE	Number of Neonates	Percentage
Failed	285	25.58%
Pass	829	74.42%
Total	1114	100%

Table 2: Percentage Distribution of Sample according to Risk Factor.

Risk Factor	Number of Neonates	Percentage
Absent	781	70.11%
Present	333	29.89%
	1114	100%

Of the 333 babies who had risk factors 261(47.45%) were low birth weight, 127 (27.09%) were premature, 22(4%) had suffered from asphyxia, 79 (14.36%) had jaundice requiring phototherapy, 30 (5.45%) had a NICU stay >5 days, 7(1.27%) had been given ototoxic medication, 5

(0.91%) had family history of deafness and 19(3.45%) had culture positive sepsis (Table 3).

Table 3: Percentage Distribution of Each Risk Factor.

Type of Risk factor	Number of neonates	Percentage (%)
No risk factor present	781	
Low Birth weight	261	47.45%
Prematurity	127	23.09%
Birth asphyxia	22	4.00%
Jaundice requiring phototherapy	79	14.36%
NICU stay >5 days	30	5.45%
Use of ototoxic medication	7	1.27%
Family history of deafness	5	0.91%
Presence of congenital infections	0	0.00%
Culture Positive Sepsis	19	3.45%
Total	550	100%

Thus there were many neonates who had more than one risk factor. First OAE was done for all 1114 neonates, 829 passed the first OAE and 285 neonates failed the first OAE. 285 neonates who had failed the first OAE were recalled back for second OAE at 6 weeks of age. Out of

the 285 babies who were called for repeat OAE, 258 turned up 27(9.47%) were lost to follow up. Out of the 258 babies who turned up, 245 passed the test while 13 failed the test (Table 4). 13 Babies who had failed the second OAE screening were called back 1 month later for BERA testing. Out of the 13 babies who turned up for BERA testing 12 passed the test and 1 failed (Table 5).

Table 4: Percentage distribution of Sample at 2nd OAE.

First OAE	Number of Neonates	Percentage (%)
Failed	13	4.56%
Pass	245	85.96%
Lost to follow-up	27	9.47%
Total	285	100%

Table 5: Percentage Distribution of Sample at BERA study.

Result of BERA Study	Number of Neonates	Percentage (%)
Fail	1	7.69%
Pass	12	92.31%
Grand total	13	

Table 6: Comparison of selected variables.

Risk Factor		Refer	Pass	Total	Chi value	P value
Low Birth Weight	Preterm	54	207	261	4.288	0.038*
	Term	231	622	853		
Prematurity	Present	30	97	127	0.290	0.590
	Absent	255	732	987		
Birth Asphyxia	Present	8	14	22	1.370	0.242
	Absent	277	815	1092		
Jaundice Requiring Phototherapy	Present	20	59	79	0.003	0.955
	Absent	265	770	1035		
NICU Stay > 5 days	Present	5	25	30	1.288	0.256
	Absent	280	804	1084		
Use of ototoxic medication	Present	2	5	7	0.033	0.856
	Absent	283	824	1107		
Family history of deafness	Present	0	5	5	1.727	0.189
	Absent	285	824	1109		
Congenital infection	Present	0	0	0	NA	NA
	Absent	285	829	1114		
Culture Positive Sepsis	Present	6	13	19	0.365	0.546
	Absent	279	816	1095		

P value <0.05 is significant

We studied the various risk factors among neonates who underwent neonatal screening (Table 6) and found low

birth weight to be the only one having a significant association (p<0.05).

DISCUSSION

Early detection of hearing impairment by screening at birth or shortly after birth helps in appropriate intervention which is critical for normal speech and language development of the child. Universal neonatal hearing screening should be done for all neonates irrespective of presence or absence of risk factors so as to identify hearing impairment at the earliest.

In our study 1 baby out 1114 failed in BERA which means a prevalence rate of 0.89 per 1000 population which is slightly lower than those reported in other studies.^{7,18,19}

Prevalence of individual risk factor as in JCIH include Low birth weight (47.45%), prematurity(23%), asphyxia (4%), Jaundice requiring phototherapy (14.36%), NICU stay >5 days (5.45%), use of ototoxic medication(1.27%), family history of deafness (0.91%), culture positive sepsis (3.45%).²⁰ The prevalence of all risk factors combined is 46.57% which is quite high as compared to other studies. The probable reason for this is our relatively small sample size and a high number of low birth weight babies.

Among neonates tested for first OAE, 26.38% failed, which is quite high as compared to other studies which have reported failure rate ranging between 7-12% on first OAE. The failure rate is high because of early discharge practice wherein quite a few babies were discharged on second day of life itself. Mukhari et al, found that 11.8% of the screened high risk neonate failed in the first OAE test which is quite similar to our study (12.3%).²¹ 13 neonates failed in both OAE screening which constitutes about 4.56% which is considerably higher as reported by other studies.

The study was conducted over a period of two years and included 1114 neonates. First OAE was not done for 106 neonates as they had either died or attendants had refused consent or were referred to higher centers. This figure amounts to 8.68% which is double than the 4% recommended cut off recommended by Universal Neonatal hearing Screening Guidelines (UNHS).

There are two big drawbacks of our study are a sample size and a lack of level 3 care NICU. Small sample size can be explained by the fact that it being a private medical college located far away from the city the number of deliveries is few. Secondly since authors lack a level 3 care NICU quite a few of our extremely premature neonates, very sick neonates, neonates requiring ventilation have to be referred to higher centers for treatment.

CONCLUSION

To conclude two step OAE screening followed by BERA can be used as a screening tool for neonatal hearing screening. Large multi centric studies are required to

calculate the incidence of neonatal hearing loss and to study significant association if any between risk factors and hearing loss.

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